

What is claimed is:

1. A method of producing a polymer composition, comprising:
  - mixing an ethylene- $\alpha$ -olefin elastomer and a polyolefin resin to provide a mixture thereof;
  - adding to the mixture one or more monomers comprising an unsaturated organic compound containing at least one carbonyl group; and
  - polymerizing one or more monomers in the presence of a grafting initiator, whereby polymers of the one or more monomers graft from a backbone of the ethylene- $\alpha$ -olefin elastomer.
2. The method of Claim 1, further comprising pelletizing the mixture, wherein the one or more monomers are added to the pelletized mixture.
3. The method of Claim 1, wherein the polymerization is performed while blending the one or more monomers with the mixture.
4. The method of Claim 1, wherein the polymerization is performed in a twin-screw extruder.
5. The method of Claim 1, wherein the initiator comprises dialkyl peroxide.
6. The method of Claim 5, wherein the initiator is added in an amount of from about 0.01 to about 1.0 wt% of the total weight of the polymer composition.
7. The method of Claim 1, further comprising pelletizing the resultant of the polymerization.
8. The method of Claim 1, wherein the mixing is performed at a temperature from about 150 to about 250 °C.
9. The method of Claim 1, wherein the mixing is performed at a temperature from about 180 to about 200 °C.
10. The method of Claim 1, further comprising adding a processing oil to the mixture.
11. The method of Claim 10, wherein the processing oil is added in an amount of about 2 wt% or less of the total weight of the polymer composition.
12. The method of Claim 10, wherein the processing oil has an aromatic carbon content of about 0.5 wt% or less.

13. The method of Claim 1, wherein the ethylene- $\alpha$ -olefin elastomer is selected from the group consisting of ethylene-propylene rubber, ethylene-butene rubber, ethylene-octene rubber, ethylene-propylene-diene rubber, ethylene-butene-diene rubber, ethylene-octene-diene rubber, and mixtures thereof.

14. The method of Claim 13, wherein the ethylene-propylene-diene rubber, ethylene-butene-diene rubber, and ethylene-octene-diene rubber comprises a diene element made of a diene compound selected from the group consisting of 5-ethylidene-2-norbornene, dicyclohexadiene, and 1,4 hexadiene.

15. The method of Claim 1, wherein the ethylene- $\alpha$ -olefin elastomer has an ethylene content of from about 30 wt% to about 75 wt%.

16. The method of Claim 1, wherein the ethylene- $\alpha$ -olefin elastomer has an ethylene content of from about 40 wt% to about 70 wt%.

17. The method of Claim 1, wherein the ethylene- $\alpha$ -olefin elastomer has an ethylene content of from about 50 wt% to about 60 wt%.

18. The method of Claim 1, wherein the ethylene- $\alpha$ -olefin elastomer is in an amount of from about 40 wt% to about 95 wt% of the total weight of the polymer composition.

19. The method of Claim 1, wherein the polyolefin resin is selected from the group consisting of high density polyethylene, low density polyethylene, linear low density polyethylene, very low density polyethylene, homo polypropylene, block polypropylene, random polypropylene and mixtures thereof.

20. The method of Claim 1, wherein the polyolefin resin has a fluidity of from about 0.5 to about 60 (g/10 min).

21. The method of Claim 1, wherein the one or more monomers are selected from the group consisting of carboxylic acid, maleic anhydride, and salts of esters.

22. The method of Claim 1, wherein the one or more monomers are in an amount from about 0.2 to about 10 wt% of the total weight of the polymer composition.

23. The method of Claim 1, wherein the one or more monomers are in an amount from about 0.5 to about 7 wt% of the total weight of the polymer composition.

24. The method of Claim 1, wherein the one or more monomers are in an amount from about 1 to about 3 wt% of the total weight of the polymer composition.

25. A polymer composition produced by the method of Claim 1.

26. A polymer composition, comprising:  
a polyolefin resin;  
a chemically modified ethylene- $\alpha$ -olefin elastomer mixed with the polyolefin resin; and

wherein the chemically modified ethylene- $\alpha$ -olefin elastomer comprises an ethylene- $\alpha$ -olefin elastomer backbone and grafted branches from the backbone, and wherein the branches comprises polymers of one or more monomers comprising an unsaturated organic compound containing at least one carbonyl group.

27. The polymer composition of Claim 26, wherein at least part of the polyolefin resin is in a chemically modified form with grafted branches, and wherein the grafted branches of the polyolefin resin comprises polymers of one or more monomers comprising an unsaturated organic compound containing at least one carbonyl group.

28. The polymer composition of Claim 26, wherein the polymer composition is in the form of pellets.

29. The polymer composition of Claim 26, further comprising a processing oil mixed therewith.

30. The polymer composition of Claim 29, wherein the processing oil is in an amount of about 2 wt% or less of the total weight of the polymer composition.

31. The polymer composition of Claim 29, wherein the processing oil has an aromatic carbon content of about 0.5 wt% or less.

32. The polymer composition of Claim 26, wherein the ethylene- $\alpha$ -olefin elastomer is selected from the group consisting of ethylene-propylene rubber, ethylene-butene rubber, ethylene-octene rubber, ethylene-propylene-diene rubber, ethylene-butene-diene rubber, ethylene-octene-diene rubber, and mixtures thereof.

33. The polymer composition of Claim 26, wherein the ethylene- $\alpha$ -olefin elastomer has an ethylene content of from about 30 wt% to about 75 wt%.

34. The polymer composition of Claim 26, wherein the ethylene- $\alpha$ -olefin elastomer has an ethylene content of from about 40 wt% to about 70 wt%.

35. The polymer composition of Claim 26, wherein the ethylene- $\alpha$ -olefin elastomer has an ethylene content of from about 50 wt% to about 60 wt%.

36. The polymer composition of Claim 26, wherein the ethylene- $\alpha$ -olefin elastomer is in an amount of from about 40 wt% to about 95 wt% of the total weight of the polymer composition.

37. The polymer composition of Claim 26, wherein the polyolefin resin is selected from the group consisting of high density polyethylene, low density polyethylene, linear low density polyethylene, very low density polyethylene, homo polypropylene, block polypropylene, random polypropylene and mixtures thereof.

38. The polymer composition of Claim 26, wherein the one or more monomers are selected from the group consisting of carboxylic acid, maleic anhydride, and salts of esters.

39. The polymer composition of Claim 26, wherein the grafted polymers of one or more monomers are in an amount from about 0.2 to about 10 wt% of the total weight of the polymer composition.

40. The polymer composition of Claim 26, wherein the grafted polymers of one or more monomers are in an amount from about 0.5 to about 7 wt% of the total weight of the polymer composition.

41. The polymer composition of Claim 26, wherein the grafted polymers of one or more monomers are in an amount from about 1 to about 3 wt% of the total weight of the polymer composition.

42. A method of improving impact strength of a plastic material, comprising:  
providing the polymer composition of Claim 26; and  
blending the polymer composition with a plastic material selected from the group consisting of nylons, acrylonitrile butadiene styrene (ABS) resins, polycarbonate, polyisobutylene, polybutene, polyvinylchloride (PVC), ethylene acrylate copolymer, high density polyethylene, low density polyethylene, linear low density polyethylene, very low density polyethylene, homo polypropylene, block polypropylene, random polypropylene and mixtures thereof.

43. The method of Claim 42, wherein the polymer composition provided is in the form of pellets.

44. The method of Claim 42, wherein the nylons comprise nylon 6 and nylon 66.